THE PLACE OF ARITHMETIC IN THE HIGH-SCHOOL CURRICULUM.

By William Wiener.

A comparative study of methods of school administration and plans upon which the writer has for some time been engaged has left the impression that courses of study in high schools smack too much of similarity. The good school becomes the object of imitation for other institutions and thus there are frequently and thoughtlessly repeated the foibles and weaknesses of strong leaders. This similarity is very apparent in the syllabi and courses of study in mathematics in the high schools. Such a condition has been brought about because it is less burdensome, following the line of least resistance, to copy study-courses, and to have the high schools patterned the one after the other, than to be original and thoughtful as to the social function of the high school. Arithmetic has not been in fashion for high schools, and it has been tabooed as a high-school subject, the thought being that arithmetic or the teaching of arithmetic is beneath the dignity of the high-school instructor. Pupils have unwittingly acquired this feeling of indifference towards arithmetic and its processes, because of the teachers' attitude toward the subject. Despite the fact that a working knowledge of arithmetic has been considered out of fashion by teachers and pupils, boys and girls of the adolescent age, with their appreciation of real values, can be induced to have an extremely high regard for this subject because it functions into their own lives and also functions into world activities and relations. The high-school period is the one in which the boy and girl is ever ready to work at arithmetical problems, feeling that experience in their solution and handling affords a reserve force and power for future advance and effort. Therefore the high-school youth are easily brought, when once the importance of the subject has been demonstrated, to look upon arithmetic as a most necessary part of the high-school career. The adolescent period, the period of

early educational life of the child, is a time of value appreciations. Is it not a fact that the emphasis placed upon the exploitation of the three R's is a naturally intuitive one? Reading must of necessity have been the first means of obtaining quiet thought transference, through records. Writing is the next method of gaining thought transference by making records. A knowledge of arithmetic, on the other hand, brings about the summation of ideals and experiences. For life is full of arithmetical situations and problems which the simple processes of arithmetic help to clarify. The school must prepare for the life to be lived. If the school through its teachings fails to make that life efficient and comfortable for the individual by developing and training along those lines which make possible the greatest rounded efficiency, the school does not perform its full social duty. A knowledge of arithmetical processes and their applications is the daily need of the individual members of society. Existence of course may continue without this knowledge, but individual social efficiency is to a great extent diminished when this arithmetical information and experience has been neglected.

It is almost unnecessary to mention the fact that in our daily walks of life systematic applications of the principles of arithmetic do necessarily produce habits of thrift and value-appreciations, an essential characteristic of American life, a characteristic necessary for the successful continuance of any nation. Naturally the impressionable period of adolescence is that during which the importance of this branch of knowledge can be most firmly established. No pupil can afford to be without training in arithmetical processes and analyses. It matters not whether the pupil intends going to college, or into business, or into the home. Arithmetical training is fundamentally and absolutely a necessary factor in a rounded training. It provides the tools for use in higher mathematical work by training for accuracy and complete conceptions of number processes, combinations and problems.

Unless the accuracy habit is fixed early in the child mind, the success of the child with mathematical subjects is ofttimes made impossible. Proper training in arithmetic therefore stresses the fundamental processes of mathematics as well as the reasoning powers of the child and thus furnishes mental attitudes and apti-

tudes, which insure a great likelihood of success in dealing with higher or advanced mathematical subjects. It need not be mentioned to you who till and toil in the mathematical field that you will reap the greatest harvest of mathematical successes whenever the mathematical soil of youth furnished you has had the advantage of previous treatment with regenerating and fertilizing mathematical experiences. It has been noted in our own school that where arithmetic has formed the basis of the mathematical superstructure of the students' course of study, failures in algebra, geometry and higher and applied mathematics are reduced to an absolute minimum. Our records definitely prove this statement.

Let us note further what the world requires. It demands not only a knowledge of correct methods but insists upon an ability to handle figures and arithmetical knowledge with precision and accuracy. The old notion of crediting the pupil with approximate or inaccurate results, as practised in the elementary grades, does not appeal to the business world, which has no idea of permitting inaccurate answers. This practise destroys the appreciation of the value and need for arithmetical accuracy in results. Here is originated the vicious and demoralizing mental habit that disregards the advantage of accurate work, in spite of the social and commercial demand for it. The high school is the place where this false impression, that inaccurate results are of value, must be destroyed. I can see no reason for the continuance of the practise even in the grades. Accuracy and precision with simple processes are absolutely required by business interests. Can a business house credit or even tolerate inaccurate results, and continue in operation? What would become of any firm that permitted such ridiculous practises? Check systems of different kinds, to insure efficiency in business affairs, are being constantly devised by accountants and auditors. The habit of accuracy is therefore a business ideal and a valuable asset.

In the elementary schools arithmetic is taught by teachers who deal with various parts of the subject, as directed in the syllabi of the school. The pupil is therefore taught arithmetic by divisions of the subject and made to feel that each division is a separate, independent and new topic. That this is the ex-

perience of boys and girls we can recall in our own time as well as observe at the present time. To be specific, long division is of a different genus from short division, entirely unrelated the one to the other, or to any other arithmetical subject. It remains for the high school to show the unity of arithmetical processes and thought, by co-ordinating and correlating these desultory elementary-school experiences with individual arithmetical topics. It has been the experience in our high school that where commercial, technical or other pupils have been thoroughly grounded in arithmetical fundamentals, it is possible for them to take advanced courses in mathematics with a larger measure of success and understanding than is possible for pupils who have not had such arithmetical preparation. The percentages of promotion of the arithmetically prepared pupils in algebra and geometry and applied mathematics are far above the average of those who were not so prepared. It is a further interesting fact to note that the boys and girls who have had arithmetic in the high schools and later entered colleges have stood the acid test of criticism and experience with college mathematics more creditably than have those who had not had arithmetic in the high school.

Arithmetic must be considered a vital and fundamental part of the high-school curriculum, despite the very general contention that it *is taught* in the elementary schools. Pupils and teachers must be made to feel that the public demand for arithmetic is based on social necessity. The high school therefore must attack this subject with thoroughness and interest, impressing upon all the importance of the accuracy and precision habit, as one of the educational factors bound to insure the success of the individual at college, in business and in the home.

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